Investigating changes in the Arctic using remotely operated vehicles

Christian Katlein
S. Arndt, M. Fernández-Méndez, B. Lange, M. Nicolaus, F. Wenzhöfer, M. Jakuba, C. German
Changes in the Arctic

Average Monthly Arctic Sea Ice Extent
September 1979 - 2013
Sea ice age

March 1988

March 2011

Ice Age

< 15%
1st. Yr.
2nd. Yr.
3rd. Yr.
4th. Yr.
5th. Yr.
and older

Arctic Report Card (NSIDC)
Climate system
The sea-ice ecosystem
Observations are sparse
Typical sea ice sampling vs. ROV
Observation class ROV

- Weight: 60 kg
- Range: 200 m
- Operators: 2-3

- operated from the ice
- high maneuverability
- limited payload
Hybrid-ROV

Weight: 1800 kg
Range: 20 km
Operators: 5-8

- operated from the ship
- limited maneuverability
- navigation relative to ice
- autonomous capabilities
Interdisciplinary sensor suite

- Sonars (Altimeter/ Multibeam)
- Cameras (HD/ upward looking)
- Light sensors
- CTD / Fluorometers
Under-ice video
Sea ice thickness/ topography

Williams et al. (2012, EOS)
Mapping of light conditions

Nicolaus et al. (2012, GRL)
Increased light availability

Nowadays three times more light is transmitted through the ice than in the 80's.
Quantification of algae
Distribution depends on topography

- **ridge**
- **level ice**

- Buoyant aggregate
- Less under-ice currents
- Redistribution by strong currents
Summary

- 2014
- 1980

3x more
Questions?